

MIL-M-17060E(SH)  
AMENDMENT 1  
15 May 1981

# MILITARY SPECIFICATION

MOTORS, 60-HERTZ, ALTERNATING CURRENT, INTEGRAL-HORSEPOWER,  
SHIPBOARD USE

This amendment forms a part of Military Specification  
MIL-M-17060E(SH), dated 20 May 1977.

## PAGE 1

2.1, under "SPECIFICATIONS, FEDERAL", delete reference to "QQ-I-666";  
add the following:

"FF-B-171 - Bearings, Ball, Annular (General Purpose).  
QQ-A-601 - Aluminum Alloy Sand Castings."

## PAGE 2

2.1, under "SPECIFICATIONS, MILITARY", delete reference to  
"MIL-P-15137"; delete "MIL-G-24508 - Grease, High Performance, Ball and  
Roller Bearing" and substitute "DOD-G-24508 - Grease, High Performance,  
Multi-Purpose (METRIC)".

2.2, under "INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)"  
add:

"IEEE STD 112 - Test Procedures for Polyphase Induction  
Motors and Generators."

## PAGE 3

2.2, under "AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)", add:

"ASTM A 47 - Malleable Iron Castings."

## PAGE 7

3.1.12.2: Delete and substitute:

"3.1.12.2 Locked-rotor current. The locked rotor current for 440V  
a.c. motors shall be in accordance with the values specified in table IV.  
Single speed design B motors driving centrifugal auxiliaries with synchro-  
nous speeds of 1200 through 3600 r/min with locked rotor and pull up  
torques equal to a minimum of 70 percent of full load torque may exceed  
the values specified in table IV by no more than 5 percent. For other  
than 440V a.c. motors, the current ratio shall be inversely proportional  
to the ratio of applicable voltages. Motors shall withstand locked rotor  
current for 20 seconds (see 3.4.10)."

FSC 6105

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TABLE IV: Delete and substitute:

"TABLE IV. Locked-rotor current, amperes, maximum.

HP	Designs B, C, and D (see notes 1 and 2)	
	Dripproof protected	All other enclosures
1	15.7	17.3
1.5	20.9	23.0
2	26.1	28.7
3	33.4	36.7
5	48	52.8
7.5	66.4	73.0
10	84.7	93.2
15	121	133
20	152	167
25	191	210
30	227	250
40	303	333
50	379	417
60	455	500
75	567	624
100	758	834
125	949	1,044
150	1,135	1,249
200	1,516	1,668
250	1,909	2,100

## Notes:

1. Design C - 3 hp through 200 hp only 1800, 1200, 900 r/min.
2. Design D - Through 150 hp only, 1800, 1200, 900 r/min."

PAGE 14

3.1.22.2.4, line 3: Delete "MIL-G-24508" and substitute "DOD-G-24508".

PAGE 18

Add as paragraphs 3.1.34 through 3.1.34.5:

"3.1.34 Efficiency. Design B continuous duty motors shall meet the requirements of 3.1.34.1 through 3.1.34.5 when tested in accordance with 4.3.4.21.

"3.1.34.1 Single speed design B motors driving centrifugal auxiliaries with synchronous speeds of 1200 through 3600 r/min shall have a minimum full load efficiency as specified in 3.1.34.1.1. These motors may exceed maximum weight specified on figures 1 through 4 by up to 20 percent.

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"3.1.34.1.1 Efficiency values shall be as follows:

Motor efficiency minimum.

Motor HP	Efficiency (Percent)	
	Dripproof enclosures	All other enclosures
200 & over	97	97
150	97	97
125	96	97
100	95	97
75	95	96
60	94	96
50	94	95
40	93	95
30	92	94

Motor HP	Efficiency (Percent)	
	Dripproof enclosures	All other enclosures
25	92	94
20	92	93
15	91	93
10	90	92
7.5	90	91
5	89	89
3	88	88
2	87	87
1.5	86	86
1	86	86

"3.1.34.2 All single speed design B motors rated 900 r/min and less shall have efficiencies not less than 2 percent less than that specified in 3.1.34.1.

"3.1.34.3 All other single speed design B motors shall have efficiencies not less than 1 percent less than that specified in 3.1.34.1.

"3.1.34.4 All multispeed design B motors, for the highest speed only, shall have efficiencies not less than 3 percent less than that specified in 3.1.34.1.

"3.1.34.5 If for special applications (see 3.1.9), motors are furnished in horsepower ratings other than those shown in 3.1.34.1, the efficiency shall be in accordance with the requirements for the next lower horsepower rating shown in 3.1.34.1."

PAGE 19

3.4 through 3.4.3: Delete.

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PAGES 20 and 21

TABLE XIII: Delete and substitute new TABLE XIII.

\*TABLE XIII. Minimum material requirements for service A motors.

Item	Limitations	Material	Specification or remarks
Motors	All sizes	Silicone	Materials containing silicone shall not be used except in brushless motors.
Ball bearings	All sizes	-----	General application FF-B-171 Noise quiet application MIL-B-17931.
Ball bearings caps	All sizes	Steel <sup>1</sup> / Malleable iron Nodular graphitic iron Aluminum	----- ASTM A 47 MIL-I-24137 Commercial treated for corrosion resistance MIL-B-3743
Brushes	All sizes	Steel <sup>1</sup> / Malleable iron Nodular graphitic iron	----- ASTM A 47 MIL-I-24137
End shields	All sizes	Steel	MIL-S-1222, grade 5, galvanized in accordance with ASTM A 153
Eyebolts, lifting	Where used	Steel	-----
Fans - external and internal	All sizes	Steel <sup>1</sup> / Aluminum	----- QQ-A-601
	-----	Malleable iron	ASTM A 47
	-----	Nodular graphitic iron	MIL-I-24137
Fans - external	External fan for totally enclosed fan cooled motors	Plastic, molded thermosetting	MIL-M-14
Flanges - armature, rotor	Where used	Steel <sup>1</sup> / Nodular graphitic iron	----- MIL-I-24137
Frames	All sizes	Steel <sup>1</sup> / Malleable iron Nodular graphitic iron	----- ASTM A 47 MIL-I-24137

See footnote at end of table.

MIL-M-17060E(SH)  
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Continued

Item	Limitations	Material	Specification or remarks
Grease cups and pipes Grease	All sizes Bearings total temperature of 149°C and below	Steel <sup>1</sup> / Petroleum	Treated for corrosion DOD-G-24508
Hand-hole or access covers	All sizes -----	Transparent plastic	MIL-E-917
Insulation - ground and phase, lead and connection, collector ring, spacers and separators, washers, bushings, tubes, wedges and lead clamp.	Class B, F, H or N	All types and classes	MIL-E-917
Lead wire	Class B, F, H or N	All types and classes	MIL-E-917, except silicone rubber of MIL-W-16878, type FF of MIL-W-16878/8 may be substituted for type FFW of MIL-W-16878/9 with prior acceptance by NAVSEA. MIL-L-17331 Navy symbol 2190TEP
Oil, lubricating	Maximum oil sump temperature 82°C		
Oil discs	All sizes	Steel <sup>1</sup> / Steel <sup>1</sup> / -----	----- -----
Part covers for totally enclosed type machines where the cover acts as a shield only, and not as a support for another part such as an auxiliary or brake.	All sizes ----- -----	Malleable iron  Nodular graphitic iron	ASTM A 47  MIL-I-24137
Quills and spiders Scraper	Where used All sizes	Steel <sup>1</sup> / Brass	----- Commercial

See footnote at end of table.

MIL-M-17060E(SH)  
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Continued

Item	Limitations	Material	Specification or remarks
Shafts	Close-coupled pumps All other motors	----- Steel	Corrosion-resistant material Tensile strength not less than 75,000 lb/in <sup>2</sup> and elongation not less than 20 percent in 2 inches.
Sleeve bearings	All sizes	Bronze Babbitt anti-friction metal	QQ-C-390, alloy 910
Terminal boxes and terminal box covers	All sizes	Steel <sup>1/</sup> Malleable iron Nodular graphite iron	QQ-T-390, grade 2 ----- ASTM A 47 MIL-I-24137
Wire electric	All types	Copper	MIL-E-917
Varnish, insulating	All classes		MIL-I-24092
Wire, end turn banding	All sizes	Steel and non-magnetic alloy	MIL-W-30508
Wedges	All sizes	Steel Brass	Commercial Commercial

<sup>1/</sup> Unless otherwise indicated steel parts may be fabricated, from cast or wrought material. Cast steel shall be in accordance with grade B of MIL-S-15083, as required.

Note: Alternate wire sizes - sizes other than those in MIL-E-917 may be used provided the design is such as to permit rewinding with a size and shape specified in MIL-E-917 and having an equivalent or higher temperature rating."

PAGE 22

3.5.1.6(e): Delete and substitute:

"(e) For 3600 r/min motors, bearings shall not exceed size 312 for drive end, nor exceed size 311 for opposite (foot-end)."

3.5.1.6(f): Add:

"(f) Other types proposed for special application requirements shall be reviewed by the command or agency concerned."

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PAGE 24

3.5.1.9, line 3: Delete "standard balance" and substitute "precision balance".

3.5.1.10: Add at end of paragraph, "Mufflers shall not be used".

PAGE 25

TABLE XVII: Delete and substitute:

"TABLE XVII. Airborne noise limits (sound pressure levels in dB re 20  $\mu$ Pa.

Hp	Enclosure type	Synchronous speed r/min	Octave band center frequency in Hz								
			31.5	63	125	250	500	1K	2K	4K	8K
1 through 60 75 through 250	DPP	3600	85	80	75	72	69	66	65	65	65
			85	80	79	79	83	75	77	71	71
1 through 250	DPP	1800 & below	85	80	75	72	69	66	65	65	65
1 through 10 15 through 75 100 through 150	All other enclosures	3600	85	80	75	72	69	66	65	65	65
			85	80	75	79	80	75	75	75	74
			85	80	75	79	82	81	79	75	74
1 through 30 40 through 150	All other enclosures	1800 and below	85	80	75	72	69	66	65	65	65
			85	80	75	79	81	80	77	70	65

PAGE 27

3.5.4.9: Delete and substitute:

"3.5.4.9 Structureborne noise. Structureborne noise of motors, when tested as specified in 4.3.4.6.1 and 4.3.4.6.2, shall not exceed the limits specified in MIL-STD-740 as type 3 equipment. The following factors shall be considered by the contractor in the design as necessary, to meet the noise limitations.

- (a) Precision machining of rolling, rubbing and fitted parts.
- (b) Maximum effort shall be made in the production phase to minimize the amount of corrections required during the final balancing phase.
- (c) Provisions shall be made for in place balancing of rotating parts and access shall be provided for this in place balancing.
- (d) Sharp cutoffs and turbulence shall be avoided in air cooling systems. Ventilation ducts and housings shall be damped, as necessary to prevent flow excited vibration.
- (e) Most favorable combination of the following:
  - (1) Number of slots per pole pitch.
  - (2) Number of slots magnetically under one pole.
  - (3) Slot frequency as a function of the natural frequency of the magnetic frame.
  - (4) Skewing of stator slots.
  - (5) Skewing of rotor slots."

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## PAGE 34

TABLE XIX: Under "Description of test" column, add: "Efficiency (may be conducted concurrent with load test)". Under "Applicable test paragraph" column, "Periodic tests", add: "4.3.3.21".

## PAGE 40

4.3.4.20: Delete and substitute:

"4.3.4.20 Sealed insulation system. Each stator including lead connections shall be subjected to and meet the requirements for short term test procedures of IEEE-STD-429 (ANSI C50-26) except that submergence shall be 24 hours and the minimum insulation resistance shall be 100 megohms. Insulation resistance reading shall be measured and recorded once per minute for the first ten minutes then once per hour for the first five hours with a final submerged reading at 24 hours. Insulation resistance shall be measured immediately after removal from submergence, and one hour after removal from submergence."

Add as paragraph 4.3.4.21:

"4.3.4.21 Efficiency. Motor efficiency shall be determined by IEEE-STD-112, method B for dynamometer, method C for duplicate machines with loss segregation identification, as required in method E for either method. Test record shall include both data with identification of stray losses in watts."

TABLE XX: Under "Description of test" column, add: "Efficiency (may be conducted concurrent with load test)". Under "Applicable test paragraph" column, "Periodic tests", add: "4.3.3.21".

## PAGE 41

5.1, line 1: Delete "repair parts and tools".

## PAGE 42

6.1.1, item "(p)": Delete.

## PAGES 45 and 46

Add as paragraphs 6.5 and 6.5.1:

"6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

"6.5.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should be specified."

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PAGES 61 and 62

Delete and substitute the attached figure 6:

PAGE 65

APPENDIX A: Paragraph 40.1.1: Delete and substitute:

"40.1.1 Place to test. Suitability tests shall be conducted at the contractors plant, at commercial laboratory or Government laboratory having necessary equipment and facility to conduct the tests specified herein. Surveillance and verification of test results to be provided by government inspector."

LAST PAGE

DD Form 1426, STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL: Delete address and substitute:

"COMMANDER  
NAVAL SEA SYSTEMS COMMAND (SEA 3112)  
DEPARTMENT OF THE NAVY  
WASHINGTON, DC 20362"

Preparing activity:  
Navy - SH  
(Project 6105-N125)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981-703-023/5132

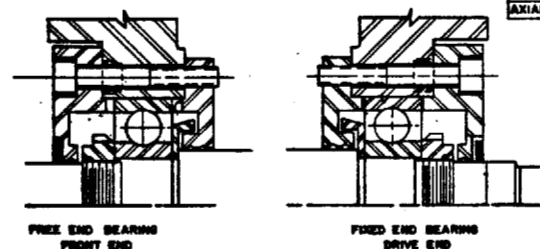
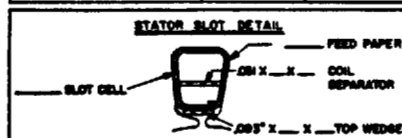
GUARANTEED PERFORMANCE AT RATED VOLTAGE & FREQUENCY				
LOAD	EFFICIENCY		POWER FACTOR	
	HIGH SPEED	LOW SPEED	HIGH SPEED	LOW SPEED
FULL				
3/4				
1/2				

LOCKED ROTOR POWER FACTOR	
LOCKED ROTOR CURRENT	
LOCKED ROTOR TORQUE _____ % OF FLT.	
START-UP TORQUE _____ % OF FLT.	
BREAKDOWN TORQUE _____ % OF FLT.	

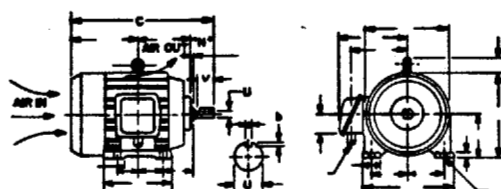
### SPECIFICATIONS AND EXCEPTIONS

THE MOTOR DESCRIBED ON THIS DRAWING IS IN ACCORDANCE  
WITH SPECIFICATION MIL-M-17050 WITH THE FOLLOWING  
EXCEPTION

STATOR: STATOR INNER _____ IN., CORE LENGTH _____ IN.			
ROTOR: DIAMETER OUTSIDE _____ IN., NO. OF BARS _____ BAR MATL. _____			
SIZE OF END RING _____ END RING MATL. _____			
WINDING DATA STATOR			
NUMBER OF POLES _____			
TYPE OF CONNECTION _____			
NUMBER OF SLOTS _____			
NUMBER OF COILS _____			
WINDING PITCH IN SLOTS _____			
TURNS IN SERIES PER COIL _____			
CONDUCTOR DIAMETER (BARE) _____ IN. AWG _____ IN. AWG _____			
CONDUCTOR INSULATION _____ J-W-O-01177 _____			
CONDUCTOR IN PARALLEL _____			
RIS. BETWEEN TURNS IN OHMS _____ @ 25°C _____ @ 25°C _____			
WEIGHT OF COPPER _____ LBS _____			



BEARING CONSTRUCTION	
BEARINGS	
MOUNTING	
LUBRICANT	
BEARING REMOVAL TOOL	
BEARING REPLACEMENT	
F.F. BRS. HOUSING DIA.	
B. & E. BRS. HOUSING DIA.	
BEARING O.D.	



GROUP	C	N	U	V	a	b
I						
II						
III						

CONNECTIONS	
LEADS	T1
	T2
	T3
NEUTRAL	



4-POLE, 3-PHASE, SERIES  
STAR CONNECTION DIAGRAM

NOISE TEST	
AIRBORNE NOISE TEST DATA	40 LEVEL RE 30in. P. SOUND PRESSURE
OCTAVE BAND CENTERS (HZ)	
31.5	
63	
125	
250	
500	
1000	
2000	
4000	
8000	

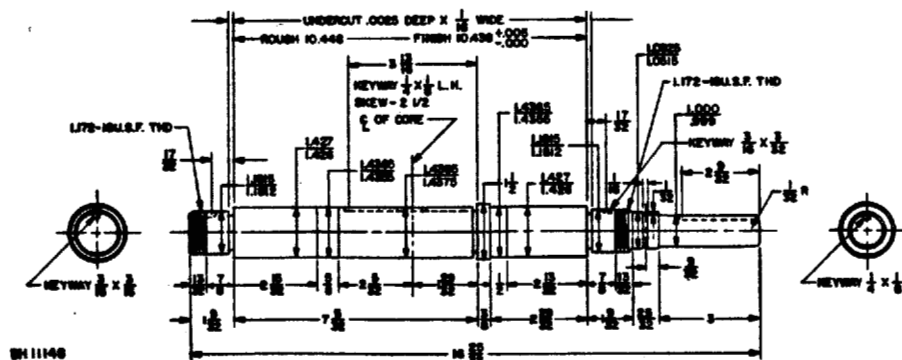
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FIGURE 6. DESIGN MANUAL A